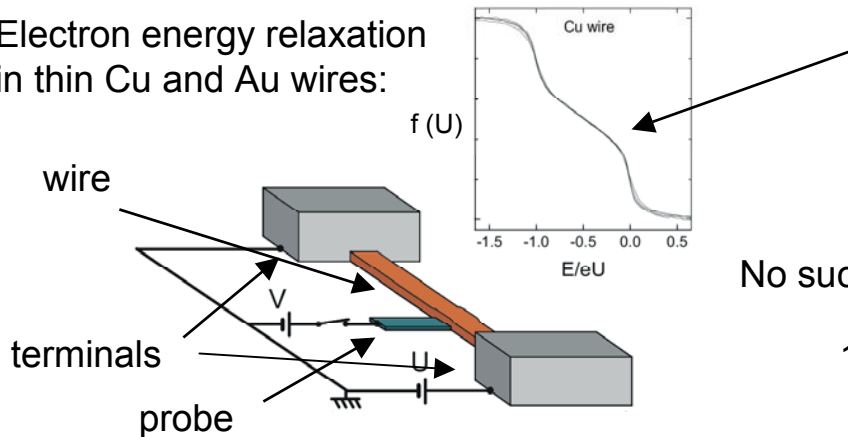


Correlated Electron Transport in Mesoscopic Structures

L.I. Glazman, University of Minnesota, DMR 9731756

Motivation: puzzling experiment from 1996: [H. Pothier et al., Phys. Rev. Lett. **79**, 3490 (1997)]

Electron energy relaxation
in thin Cu and Au wires:



All curves measured at different voltages
have exactly the same shape, therefore:

$$\text{energy transfer probability} \rightarrow K(E) \propto \frac{1}{E^2} \leftarrow \text{energy transferred}$$

No such mechanism of electron interaction was known in 1996

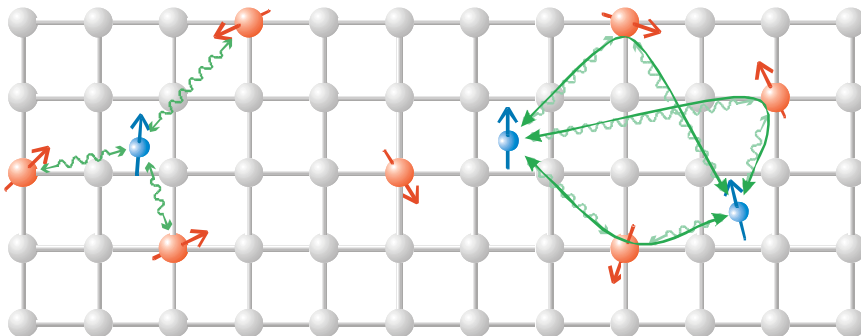
1997-2000: still no explanation despite substantial efforts
of many theorists

2001-2002: Explanation found! [A. Kaminski and L.I. Glazman, Phys. Rev. Lett. **86**, 2400 (2001)]

Key: MAGNETIC IMPURITIES

electrons interact with spins
of magnetic impurities...

...and, through the impurities,
with each other!

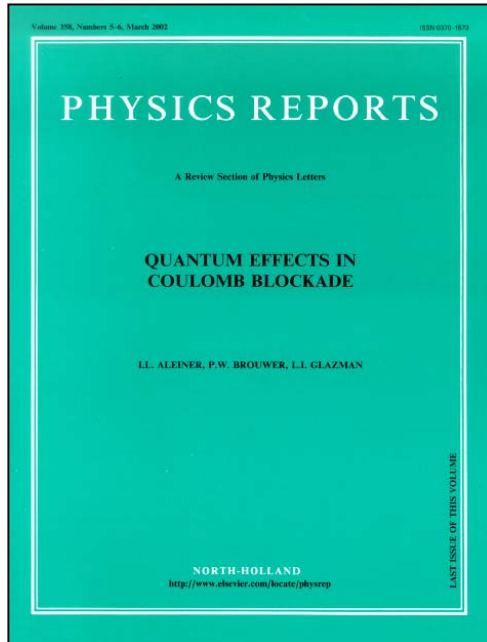


**The new mechanism
of electron-electron interaction
provides for:**

- an excellent agreement with experiments
- predictions which are successfully verified
by subsequent experiments

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Electrons are elementary particles that have a tiny, but discrete charge. In conventional wires, electrons flow like a liquid, much like water flows through plumbing pipes. However, if wires are scaled down to nanometer sizes, the quantum nature of electrons becomes important. Electrons in a nano-device may propagate like waves in a wave guide, or be dispensed discretely, one by one. Mesoscopic physics studies the behavior of electrons in such small devices. Shown here are three papers for non-specialists: state-of-the-art theory review ([Physics Reports](#)), resource letter introducing mesoscopic physics to school teachers and college instructors ([American Journal of Physics](#)), and article on new aspects of mesoscopic physics for broad audience ([Physics World](#)).